WSDOT PAVEMENT GUIDE

Volume 1

Pavement Policy

For Design, Evaluation and Rehabilitation

Washington State Department of Transportation

FOREWORD

This guide has been prepared for WSDOT personnel In designing, constructing and maintaining pavement structures. Volume 1 includes policy statements on pavement design and rehabilitation. Volume 2 is a set of notes which provide background information on pavement design, construction, performance, rehabilitation, and maintenance. Volume 3 contains computer user guides and case studies.

Volume 1 (Pavement Policy) contains two sections and is used to provide an overview of WSDOT policy with respect to the pavement design process, procedures, and pavement type selection.

The guide will be continually updated and, as such, revisions will be issued periodically.

SECTION 1.0

AN INTRODUCTION TO THE GUIDE

This SECTION provides an introduction to the Guide (relationship to the WSDOT Design Manual, format, and future revisions).

1. PURPOSE

1.1 GENERAL

This guide is the product of WSDOT pavement experience, research (state, national, international) and various analyses. The need for this document became more apparent as WSDOT adopted new state-of-the-practice and state-of-the-art design practices. Further, the manual will be of value to both Region (formerly Districts) and Headquarters personnel in designing and evaluating pavement structures. Possibly as important, is the need to understand why pavements perform the way they do. These kinds of issues were not addressed in prior versions of the WSDOT Design Manual.

1.2 RELATIONSHIP TO WSDOT DESIGN MANUAL

Pavement design information previously contained in the Design Manual is largely replaced by this guide. Refer to Division 5 in the Design Manual for additional pavement related information.

2. FORMAT

Volume 1 of this guide is focused on WSDOT pavement policy. Volume 2 provides insight into the how and why of related pavement design, construction, performance, rehabilitation and maintenance. The guide will be used in training sessions to be offered periodically to WSDOT personnel. Volume 3 provides documentation of pavement design software and case studies.

3. REVISIONS

The Pavement Guide will not remain static. It will be updated and revised to incorporate new, improved concepts and designs.

The loose-leaf format and numbering system will facilitate the revision and continued updating of the guide. WSDOT will attempt to maintain a mailing list of all guide holders to enhance the receipt of updates; however, each person/office with this guide is ultimately responsible for keeping same in an up-to-date condition.

SECTION 2.0

PAVEMENT DESIGN POLICY

This SECTION is used to describe the WSDOT pavement design policies for both flexible and rigid pavements, new and rehabilitated pavements, and the pavement type selection process.

1. INTRODUCTION

1.1 BASIC ELEMENTS

The basic elements of the paving structure include the surfacing, base course (stabilized or unstabilized) and subbase(s) course (as required). Pavement structures are divided into two general classifications based on the type of pavement structure typical to each: flexible and rigid. Flexible pavements have some type of bituminous surfacing and rigid pavements portland cement concrete (PCC).

1.2 PURPOSE OF SURFACING AND BASE COURSES

The surfacing and base courses are layers of high stiffness and density. Their principal purpose is to distribute the wheel load stresses within the pavement structure and thus protect the subgrade soils against excessive deformation or displacement. Where water is expected to accumulate, the base material should be free-draining.

1.3 FROST ACTION

Greater depths of base or selected free-draining borrow materials are usually necessary in areas where frost action is severe or the subgrade soil is extremely weak. Selected borrow may also be used, in the interest of economy, in locations where suitable materials are available and less expensive than base materials of higher quality. Asphalt Concrete Base (ACB) may be required, especially for projects west of the Cascades, when construction schedules are crucial, to protect the subgrade from external moisture.

2. PAVEMENT TYPE DETERMINATION

The determination of pavement structure type is of major importance in the development of plans for any highway paving project. The primary factors to be considered in determining the pavement type are:

- Traffic
- Subgrade soils
- Environment (weather)
- Materials
- Construction factors
- Provisional construction
- Life cycle cost analysis

- Secondary factors such as
    - Traffic safety
    - Availability of local materials
    - Adjacent existing pavement structures
    - Stage construction
    - Conservation of aggregate or recycling opportunities

Most of the primary factors will be briefly discussed in the following paragraphs.

Pavement type selection is the responsibility of the WSDOT Pavement-Type Selection Committee which is composed of

- Assistant Secretary for Program Development (Chair)
- Assistant Secretary for Operations
- State Design Engineer
- Program Management Engineer
- Materials Engineer
- Regional Administrator of the region in which the project under consideration is located

This committee was established by WSDOT Directive D21-02 on July 7, 1992. The Pavement Type Selection Committee Directive is shown as Appendix 2.1 (this section).

The Pavement-Type Selection Committee will evaluate all projects with new or reconstructed pavements of two centerline miles or more in length, on the National Highway System (Interstate and Principal Arterial).

2.1 DESIGN PERIOD

The design period is the time from original construction to a terminal condition for a pavement structure. AASHTO essentially defines design period, design life and performance period as being the same terms. AASHTO defines an analysis period as the time for which an economic analysis is to be conducted. Further, the analysis period can include provision for periodic surface renewal or rehabilitation strategies which will extend the overall service life of a pavement structure before complete reconstruction is required.

The design periods used by WSDOT are chosen so that the design period traffic will result in a pavement structure sufficient to survive through the analysis period. It is recongnized that intermittent treatments may be needed to preserve the surface quality and ensure that the structure lasts through the analysis period. Correspondingly the following design periods are recommended as a function of highway classification:

	Design Period
• National Highway System (NHS)	
- NHS Trunk (Interstate):	40 years
- NHS Branch (Principal Arterial):	40 years
• Non-Federal Aid (Minor Arterial, Collector)	
- High ESALs (Greater than 100,000 ESALs per year)	40 years
- Low ESALs (Less than 100,000 ESALs per year)	20 years

The 40 year design periods can be reduced for unique, project specific conditions such as temporary HOV lane pavements, future planned realignment or grade changes, etc. The 20 year design period can be increased for those routes with future, large expected increases in traffic (ESALs), anticipated functional class change, etc.

It should be noted that doubling the design period traffic (ESALs) adds about 30 mm of AC or PCC to the initial structural thickness of a flexible or rigid pavement design.

2.2 TRAFFIC

The volume and character of traffic, expressed in terms of 80 kN equivalent single axle loads (ESALs) for structural design purposes strongly influences pavement structural requirements. Both flexible and rigid pavement structures can be designed to meet most ESAL requirements; however, this does not imply similar maintenance and resurfacing requirements.

2.3 ECONOMIC

2.3.1 LIFE CYCLE COSTS REQUIREMENT

The economic evaluation process to be used for the purpose of comparing various new, reconstruction, and rehabilitation pavement alternatives is the life cycle cost analysis approach. A life cycle cost analysis is one that considers the cost of construction, rehabilitation, maintenance, salvage value, and related user costs of a facility over an analysis period that usually encompasses the service life of all alternatives.

For new and reconstructed pavement structures, the alternative pavement structures must have approximately equal ESAL capability.

When conducting a project life cycle cost analysis for various paved pavement types, the analysis should compare the present worth of all costs associated with each type (or alternative) over a period of 20 to 40 years (see Paragraph 2.1). The costs normally associated with such estimates are:

- Initial construction costs,
- Rehabilitation costs,
- Maintenance costs,
- Salvage value, and
- User costs (mostly in terms of user delay for rehabilitation projects).

These costs are summarized over the analysis period by discounting all costs that occur at different times using the present worth method to account for the time value of money. The comparative costs may be shown as either total present worth or an annualized cost.

Data on pavement types in present use is sufficient to permit reasonably accurate estimates of initial construction costs and future rehabilitation costs (such as overlays). However, many assumptions must still be made regarding pavement durability and service life under various climate and service conditions.

Additional background information on computational approaches, discount rates, analysis periods and cost factors are shown in Volume 2, SECTION 8.0. Software is available from the WSDOT Materials Laboratory to aid in the computations. All life cycle cost analyses should be coordinated through the WSDOT Materials Laboratory.

2.3.2 TYPES OF COSTS

2.3.2.1 Initial Construction Costs

The more common structural alternatives are usually: portland cement concrete pavement (PCCP), new asphalt concrete pavement (ACP), or overlay with either asphalt concrete (AC) or PCC. All details regarding the design of the alternatives shall be coordinated with the Regional Materials Engineer and the Pavement Design Engineer.

Typically new PCCP construction will consist of 215 to 330 mm of PCCP over asphalt concrete base (ACB), or asphalt treated permeable base (ATPB. This alternative will provide the longest service life and will set the analysis period of about 40 years. Typically, the PCCP surface will require grinding and joint resealing at 20 years. New ACP and ACB will usually consist of similar thicknesses over various combinations of ATPB, asphalt treated base (ATB), and crushed surfacing, depending on design needs. This option will typically need resurfacing every 10 to 15 years depending upon the traffic level and environment. The overlay options will follow about the same performance patterns.

The construction costs should reflect all unique costs associated with each alternative. For instance, each alternative has different roadway sections and material quantities, this should be accounted for in the analysis. Items that may be common to each pavement type, such as, bridge and embankment considerations, guard rail, etc., need not be included in the analysis, due to repetition. Overlay options will also require some grade adjustment of adjacent ramps, guard rails, barriers, etc. These added costs, which are unique to each alternative, should be included in the analysis.

2.3.2.2 Maintenance Costs

Maintenance costs are those costs associated with maintaining the pavement surface at some acceptable level. Since WSDOT normally programs the rehabilitation of its pavements early in the pavement deterioration cycle, there are not consistent maintenance cost differences associated with the various rehabilitation alternatives. When maintenance costs are available for the alternatives considered, they should be incorporated into the life cycle cost analysis.

2.3.2.3 Rehabilitation Costs

These costs represent the costs associated with each alternative, such as, grinding and joint resealing of the PCCP at 20 years, or overlaying the ACP at 10 to 15 years. They are computed in a manner consistent with the initial construction costs.

2.3.2.4 Salvage Value

The salvage value is the relative value of the various alternatives at the end of the analysis period. If an alternative has reached its full life cycle at the end of the analysis period, it is generally considered to have no remaining salvage value. If it has not completed a life cycle, it is given a salvage value which is usually determined by multiplying the last construction or resurfacing cost by the ratio of the remaining expected life cycle to the total expected life.

2.3.2.5 User Delay Costs

User delay costs are those costs that are accrued by the user of the facility during the construction, maintenance and/or rehabilitation of a roadway section. These costs are in the form of delay due to speed changes, speed reductions, and idling time.

2.4 SUBGRADE SOILS

The characteristics of native soils directly affect not only the pavement structure design, but may even dictate the type of pavement best suited for a given location. A careful evaluation of soil characteristics is a basic requirement for each individual pavement structure design. For example, a new embankment placed on subgrade soils with a high organic content are apt to settle (even after preconsolidation measures). A flexible pavement structure might be more suitable in this kind of situation.

2.5 ENVIRONMENT/WEATHER

Rainfall, snow and ice, and frost penetration will seasonably influence the bearing capacity of unstabilized materials. Moisture, freezing and thawing, and winter cleaning operations have a direct effect on pavement wearing surfaces which will be reflected in the cost of maintenance and repairs. The type of surface will in turn have some effect on the ease of winter operation, depending on its properties of thermal absorption or ability to resist damage from snow and ice control equipment or materials.

The total depth of the pavement structure is extremely important in high frost penetration areas. Additional base or subbase material is often effectively used to combat this problem. An effective measure is to have the pavement structure (total of surfacing and base) at least equal to one-half the maximum expected depth of freeze when the subgrade is classified as a frost susceptible soil.

2.6 PRIOR PERFORMANCE

The WSDOT Pavement Management System is an extremely valuable resource with regard to prior pavement performance information relevant to pavement type determination.

Past performance is a valuable guide of conditions and service requirements if the reference pavements are comparable to those for the design under study. Caution is urged, however, against reliance on short-term performance records, and on long-term records of pavements which may have been subjected to much lighter loadings for a large portion of their present life. For example, WSDOT rigid pavement on the Interstate system was largely built during the 1960s. As of today, that results in an initial performance period of about 30 years, which is quite good. However, the traffic growth in terms of ESALs has been substantial. Thus, pavements today are accumulating traffic loads at a far higher rate than during the 1960s and 1970s. Therefore, previous designs that worked well may not be adequate for current and future traffic demands. More specifically, for example, for PCCP, dowel bars may be required at transverse contraction joints for heavily trafficked pavement. In the past, this was not the case.

Climate may have significant effect on pavement performance and must be carefully considered in evaluating performance records from other regions.

3. NEW FLEXIBLE PAVEMENT DESIGN

3.1 DESIGN PROCEDURES

"New flexible pavement design" shall include reconstructed as well as all new pavement structures.

The basic design procedure for flexible pavement structures will be that as set forth in the *AASHTO Guide for Design of Pavement Structures* (1986 or 1993 or later version) and contained in this guide (refer to Volume 2, SECTION 5.0 for additional details). Further, certain minimum layer thicknesses as well as maximum lift thicknesses are controlled by requirements contained within WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* (which also set forth other pavement material requirements such as grading, fracture, cleanliness, etc.).

3.2 TERMINOLOGY

The various classes of asphalt concrete pavements are subdivided into leveling or wearing courses (designated ACP), and pavement base course (ACB). Asphalt treated base (ATB) applies to mixtures of paving asphalt and aggregates meeting requirements for its particular design function but not meeting specification requirements of either ACP or ACB. Asphalt treated permeable base (ATPB) is used to enhance pavement subsurface drainage. Crushed Surfacing Top Course, Crushed Surfacing Base Course, Crushed Surfacing, and Gravel Base in general are designated CSTC, CSBC, CS, and GB.

3.3 DETERMINATION OF PAVEMENT LAYER THICKNESSES

3.3.1 INTRODUCTION

Layer thicknesses and total pavement structure over subgrade soils for flexible pavements are fundamentally based on four criteria:

- Depth to provide a minimum level of serviceability for the design period,
- Depth to prevent excessive rutting,
- Depth to prevent premature fatigue cracking of the AC layers, and
- Depth to provide adequate frost depth protection.

Prior to the development of this guide, the load supporting ability of the subgrade soil was determined almost exclusively by use of the Hveem Stabilometer (measures resistance to plastic flow in terms of an R value). The R value was then converted to a total surfacing depth through the use of the Traffic Index (similar to but not the same as ESAL). The total surfacing depth would then be modified (depending on class of highway) into various material layer thicknesses such as ACP, ACB, ATB, CTB, and CS.

By adopting the *AASHTO Guide for Design of Pavement Structures*, the material input for flexible pavement design can be based on a number of possible inputs such as

- Resilient modulus
- Laboratory obtained
- Field obtained through nondestructive testing, or
- R value
- Other approved tests.

Resilient moduli (an estimate of a materials modulus of elasticity (E)) are the primary material inputs into the 1986 and 1993 versions of the *AASHTO Guide for Design of Pavement Structures*, as well as the WSDOT AC overlay design procedure (EVERPAVE). Thus, the prior, principal test procedure can still be used (R value) or resilient moduli can be estimated.

3.3.2 MAINLINE ROADWAY

The structural design of mainline flexible pavements can be broadly divided into those with fewer than 500,000 ESALs for the design period and those greater than 500,000 ESALs. Those pavements with fewer than 500,000 ESALs and ADT less than 2000 which can be classified as a low volume rural highway shall be considered for a bituminous surface treatment surfacing (Class A). For pavements with higher ESAL and ADT levels, an ACP surfacing should be considered. Tables 2.1 and 2.2 provide overviews of typical layer thicknesses for ACP surfaced flexible pavements (ACP is Class A mix or equivalent, ACB is Class E mix or equivalent, ATB is asphalt treated base, ATPB is asphalt treated permeable base, and CS is crushed surfacing) for ESAL levels greater than 500,000. Table 2.2 is applicable for pavement structures that may encounter excessive moisture conditions. Figure 2.1 shows sketches of options for improved subsurface drainage. Structural designs other than those shown in Tables 2.1 and 2.2 can be used if justified by use of job specific input values in the *AASHTO Guide for Design of Pavement Structures*. (Note: the input values used to prepare Tables 2.1 and 2.2 are shown at the bottom of each table. Other input values used by Regional personnel must be approved by the WSDOT Materials Laboratory.)

Table 2.1. Flexible Pavement Layer Thicknesses Without Improved Subsurface Drainage for New or Reconstructed Pavements

Design Period ESALs	Subgrade Condition	Layer Thicknesses,[1] mm											
		Reliability = 75%				Reliability = 85%				Reliability = 95%			
		ACP Class A	ACB Class E	ATB	CS[2]	ACP Class A	ACB Class E	ATB	CS[2]	ACP Class A	ACB Class E	ATB	CS[2]
500,000-1,000,000	Poor	105	—	—	380	120	—	—	400	135	—	—	440
	Average	105	—	—	200	120	—	—	215	135	—	—	230
	Good	105	—	—	75	120	—	—	75	135	—	—	75
1,000,000-5,000,000	Poor	105	90	90	90	105	105	90	90	105	135	90	90
	Average	105	90	—	90	105	105	—	90	105	135	—	90
	Good	75	75	—	90	75	75	—	90	105	75	—	90
5,000,000-10,000,000	Poor	105	120	90	105	105	135	90	105	105	165	90	105
	Average	105	120	—	105	105	135	—	105	105	150	—	105
	Good	75	90	—	105	105	75	—	105	105	90	—	105
10,000,000-25,000,000	Poor	105	150	90	135	105	165	90	135	105	210	90	135
	Average	105	135	—	135	105	150	—	135	105	180	—	135
	Good	105	75		135	105	90	—	135	105	120	—	135
25,000,000-50,000,000	Poor	105	180	90	135	105	210	90	135	105	245	90	135
	Average	105	165	—	135	105	180	—	135	105	230	—	135
	Good	105	105	—	135	105	120	—	135	105	150	—	135
50,000,000-75,000,000	Poor	105	210	90	135	105	230	90	135	105	260	90	135
	Average	105	180	—	135	105	210	—	135	105	245	—	135
	Good	105	120	—	135	105	135	—	135	105	165	—	135

[1]Based on 1986 *AASHTO Guide for Design of Pavement Structures* for flexible pavements and the following inputs:

- $\Delta PSI = 1.5$
- $S_0 = 0.50$
- $m = 1.0$

- $a_{CL.A} = 0.44$
- $a_{CL.E} = 0.44$
- $a_{ATB} = 0.30$
- $a_{CS} = 0.13$

- Subgrade Condition (effective modulus)
  - Poor: M_R = 5,000 psi (35 MPa)
  - Average: M_R = 10,000 psi (70 MPa)
  - Good: M_R = 20,000 psi (140 MPa)

  (Note: Effective modulus represents the subgrade modulus adjusted for seasonal variation)

[2]GB may be substituted for a portion of CS when the required thickness of CS = 210 mm. The minimum thickness of CS is 105 mm when such a substitution is made.

Shaded areas indicate unlikely combinations of ESALs and reliability for mainline roadways

Table 2.2. Flexible Pavement Layer Thicknesses with Improved Subsurface Drainage for New or Reconstructed Asphalt Concrete Pavements

Design Period ESALs	Subgrade Condition	Layer Thicknesses,[1] mm											
		Reliability = 75%				Reliability = 85%				Reliability = 95%			
		ACP Class A	ACB Class E	ATPB	CS[2]	ACP Class A	ACB Class E	ATPB	CS[2]	ACP Class A	ACB Class E	ATPB	CS[2]
500,000-1,000,000	Poor	105	—	100	245	120	—	100	245	135	—	100	275
	Average	105	—	100	90	120	—	100	90	135	—	100	105
	Good	105	—	100	—	120	—	100	—	135	—	100	75
1,000,000-5,000,000	Poor	105	120	100	90	105	135	100	90	105	165	100	90
	Average	165	—	100	90	105	75	100	90	105	105	100	90
	Good	120	—	100	90	120	—	100	90	150	—	100	90
5,000,000-10,000,000	Poor	105	150	100	105	105	165	100	105	105	200	100	105
	Average	105	75	100	105	105	105	100	105	105	135	100	105
	Good	135	—	100	105	150	—	100	105	165	—	100	105
10,000,000-25,000,000	Poor	105	180	100	135	105	200	100	135	105	245	100	135
	Average	105	105	100	135	105	135	100	135	105	165	100	135
	Good	150	—	100	135	165	—	100	135	105	90	100	135
25,000,000-50,000,000	Poor	105	210	100	135	105	245	100	135	105	275	100	135
	Average	105	135	100	135	105	165	100	135	105	200	100	135
	Good	105	75	100	135	105	90	100	135	105	120	100	135
50,000,000-75,000,000	Poor	105	245	100	135	105	260	100	135	105	305	100	135
	Average	105	150	100	135	105	180	100	135	105	210	100	135
	Good	105	90	100	135	105	105	100	135	105	135	100	135

[1]Based on 1986 *AASHTO Guide for Design of Pavement Structures* for flexible pavements and the following inputs:

- $\Delta PSI = 1.5$
- $S_0 = 0.50$
- $m = 1.0$

- $a_{CL.A} = 0.44$
- $a_{CL.E} = 0.44$
- $a_{ATB} = 0.30$
- $a_{CS} = 0.13$

- Subgrade Condition (effective modulus)
  - Poor: M_R = 5,000 psi (35 MPa)
  - Average: M_R = 10,000 psi (70 MPa)
  - Good: M_R = 20,000 psi (140 MPa)

  (Note: Effective modulus represents the subgrade modulus adjusted for seasonal variation)

[2]GB may be substituted for a portion of CS when the required thickness of CS 210 mm. The minimum thickness of CS is 105 mm when such a substitution is made.

Shaded areas indicate unlikely combinations of ESALs and reliability for mainline roadways

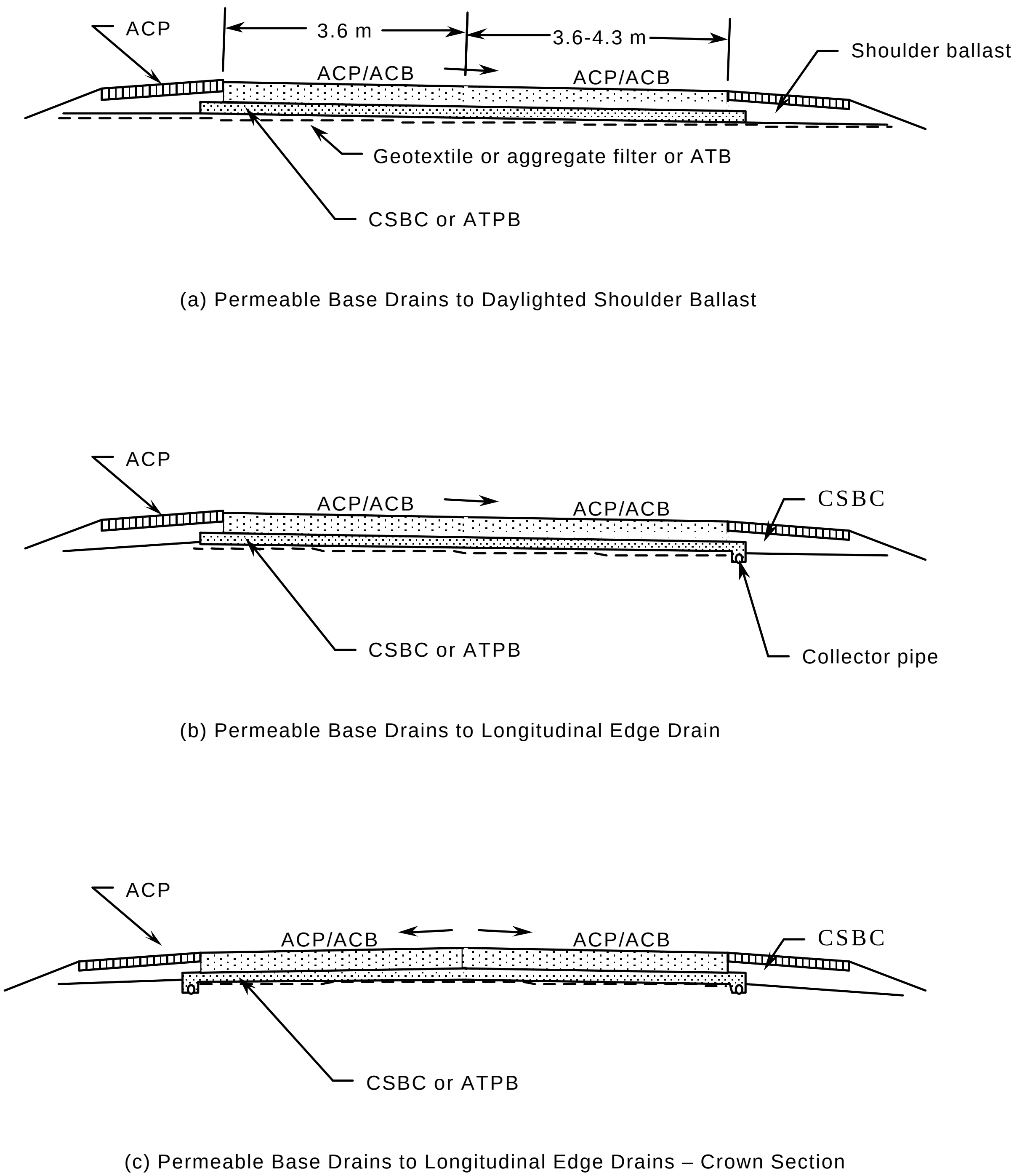


Figure 2.1. Flexible Pavement Sections with Improved Subsurface Drainage

Tables 2.3 and 2.4 provide overviews of typical layer thicknesses for flexible pavements with ESAL levels of 500,000 or less. Table 2.3 is for BST surfaced and Table 2.4 for ACP surfaced. The BST surface course is considered the most economical choice for low ESAL pavements (Table 2.3). The ACP surface course should only be used for special cases (Table 2.4) such as high urban traffic volumes but low design period ESALs.

The reliability levels to use in Tables 2.1, 2.2, 2.3, and 2.4 are

- National Highway System (NHS)
  - NHS Trunk (Interstate): 95%
  - NHS Branch (Principal Arterial): 85%
- Non Federal Aid (Minor Arterial, Collector): 75%

The total depth of the pavement section must exceed one-half of the maximum expected depth of freezing when the subgrade is classified as a frost susceptible soil.

3.3.3 RAMPS AND FRONTAGE ROADS

Ramps should be considered structurally equivalent to the mainline pavement in urban areas. In rural areas, ramps should be designed for the expected traffic.

Frontage roads which are maintained by WSDOT should be designed in accordance with the *AASHTO Guide for Design of Pavement Structures*. Frontage roads that counties and cities are to accept and maintain but constructed by WSDOT should be designed to the standards of the accepting agency.

The total depth of the pavement section must exceed one-half of the maximum expected depth of freezing when the subgrade is classified as a frost susceptible soil.

3.3.4 REST AREAS

The minimum flexible pavement requirements for rest area roadways and parking areas are:

- Ramps, Access Roads, and Truck Parking: 105 mm ACP, 90 mm CS
- Car Parking: 75 mm ACP, 90 mm CS

Table 2.3. Flexible Pavement Layer Thicknesses for Low ESAL Levels and New or Reconstructed Pavements—BST Surfaced

BST Surfaced

Design Period ESALs	Subgrade Condition	Required SN	Layer Thicknesses,[1] mm	
			Reliability = 75%	
			BST[3] (Class A)	CS[2]
< 100,000	Poor	2.53	25	455
	Average	1.93	25	340
	Good	1.45	25	280[4]
100,000-250,000	Poor	2.95	25	540
	Average	2.25	25	400
	Good	1.71	25	305
250,000-500,000	Poor	3.31	25	605
	Average	2.53	25	455
	Good	1.93	25	340

[1]Based on 1986 *AASHTO Guide for Design of Pavement Structures* for flexible pavements and the following inputs:

- ΔPSI = 1.7
- S_0 = 0.50
- m = 1.0
- a_{BST} = 0.20 (assumes E_{BST} = 100,000 psi)
- a_{CS} = 0.13
- SN = a_{BST} (1") + 0.13 (CS)
- Subgrade Condition (effective modulus)
  - Poor: M_R = 5,000 psi (35 MPa)
  - Average: M_R = 10,000 psi (70 MPa)
  - Good: M_R = 20,000 psi (140 MPa)

  (Note: Effective modulus represents the subgrade modulus adjusted for seasonal variation)

[2]GB may be substituted for a portion of CS when the required thickness of CS 210 mm. The minimum thickness of CS is 105 mm when such a substitution is made.

[3]BST Class A assumed thickness = 25 mm

[4]CS thickness increased to a total pavement structure of approximately 305 mm based on moisture and frost conditions.

Table 2.4. Flexible Pavement Layer Thicknesses for Low ESAL Levels and New or Reconstructed Pavements—ACP Surfaced

ACP Surfaced

Design Period ESALs	Subgrade Condition	Layer Thicknesses,[1] mm Reliability = 75%	
		ACP Class B	CS[2]
< 100,000	Poor	75	250
	Average	75	230[3]
	Good	75	230[3]
100,000-250,000	Poor	90	290
	Average	90	215[3]
	Good	90	215[3]
250,000-500,000	Poor	105	305
	Average	105	200[3]
	Good	105	200[3]

[1]Based on 1986 *AASHTO Guide for Design of Pavement Structures* for flexible pavements and the following inputs:

- $\Delta PSI = 1.7$
- $S_0 = 0.50$
- $m = 1.0$
- $a_{CLA} = 0.44$
- $a_{CS} = 0.13$
- Subgrade Condition (effective modulus)
  - Poor: M_R = 5,000 psi (35 MPa)
  - Average: M_R = 10,000 psi (70 MPa)
  - Good: M_R = 20,000 psi (140 MPa)

  (Note: Effective modulus represents the subgrade modulus adjusted for seasonal variation)

[2]GB may be substituted for a portion of CS when the required thickness of CS   245 mm. The minimum thickness of CS is 105 mm when such a substitution is made.

[3]CS thickness increased to a total pavement structure of 305 mm based on moisture and frost conditions.

Project specific traffic and subgrade soil conditions may require thicker pavement layers. Such designs should be done in accordance with the *AASHTO Guide for Design of Pavement Structures*.

The total depth of the pavement section must exceed one-half of the maximum expected depth of freezing when the subgrade is classified as a frost susceptible subgrade.

3.3.5 SHOULDERS

The minimum requirements for flexible pavement shoulders are:

• Interstate	75 mm ACP 105 mm CS Variable Depth Gravel Base*
• Non-Interstate	45 mm ACP 105 mm CS Variable Depth Gravel Base*

(*Note: The depth of Gravel Base shall extend to the bottom of the mainline pavement base course.)

Project specific traffic and subgrade soil conditions may require thicker pavement layers. Such designs should be done in accordance with the *AASHTO Guide for Design of Pavement Structures*.

The total depth of the pavement section must exceed one-half of the maximum expected depth of freezing when the subgrade is classified as a frost susceptible subgrade.

4. NEW RIGID PAVEMENT DESIGN

4.1 DESIGN PROCEDURES

"New rigid pavement design" shall include reconstructed as well as all new pavement structures.

The basic design procedure for rigid pavement structures will be that as set forth in the *AASHTO Guide for Design of Pavement Structures* (1986 or 1993 or later version) and contained in this guide (refer to Volume 2, SECTION 6.0 for additional details). Further, certain minimum layer thicknesses are controlled by requirements contained within WSDOT's *Standard Specifications for Road, Bridge and Municipal Construction* (which also sets forth other pavement material requirements such as grading, fracture, cleanliness, etc.).

The principal type of rigid pavement used by WSDOT in the past and will be continued for the foreseeable future is a plain, jointed PCCP (with or without dowel bars).

4.2 DETERMINATION OF PAVEMENT LAYER THICKNESSES

4.2.1 INTRODUCTION

Based on the past performance of PCCP on the state route system under a variety of traffic conditions (various ESAL levels) and on city streets (such as the city of Seattle), it is advisable to use slab thicknesses of 200 mm or greater even if the ESAL levels would suggest that lesser slab thicknesses would be adequate. A slab thickness of 200 mm or greater provides some assurance of adequate long-term performance given that the other design details are adequately accommodated. Past PCCP performance also suggests that rigid pavement, unlike flexible pavements, can be designed for initial performance periods of 30 to 40 years. This is of significant benefit where rehabilitation and maintenance activities are highly constrainted (such as urban roads and streets and all Interstate pavement).

In the past, base depths under rigid pavements were determined primarily by the requirement for support of construction traffic. Currently, it is recognized that the base course directly beneath PCC slabs is a critical element in the performance of PCCP. Previous to this Guide, ATB was used to support construction traffic prior to placement of PCCP. Recent WSDOT experience indicates some degradation of the ATB material beneath various Interstate PCCP pavements. For this reason, ACB is recommended as the supporting layer for PCC slabs where in the past ATB was used. Further, ATPB or CTPB is recommended as the PCC slab supporting layer for high ESAL environments.

Where ACB is to be used beneath PCC and most of the ACB is placed on the grading contract, a minimum of 30 mm of the layer should be reserved for placement on the paving contract for the necessary leveling operations (typically this ACP is Class A or B). For this lift of material, special provisions should provide for a maximum aggregate size approximate for the lift depth. Allow sufficient extra material to permit preleveling and making up for deficiency and settlement of existing grade. ACB is most effective in waterproofing the grade when the grade is in reasonably good shape. The benefits of a waterproofing treatment under the ultimate pavement is largely lost if an untreated base is placed directly over the subgrade and then allowed to stand over the winter without an ACB "surface."

4.2.2 MAINLINE ROADWAYS

Tables 2.5 and 2.6 provide typical PCC slab thicknesses for various levels of ESALs and reliability. The input values used to produce the tables are shown at the bottom. The slab thicknesses were calculated using a J factor of 3.4 (Table 2.5) or J = 2.7 (Table 2.6), which are estimates of contraction joint performance. A J factor of 3.4 is

Table 2.5. PCC Slab Thicknesses for Limited Contraction Joint Performance for New or Reconstructed Pavements (Non-Doweled Joints and CSBC)

Design Period ESALs	Slab Thickness,[1] mm		
	Reliability 75%	Reliability 85%	Reliability 95%
<5,000,000	225	240	260
5,000,000-10,000,000	250	265	290
10,000,000-15,000,000	270	285	310

[1]Based on 1986 *AASHTO Guide for Design of Pavement Structures* for plain jointed pavement and the following inputs:

- J = 3.4
- E_c = 4,000,000 psi (27,600 MPa)
- ΔPSI = 1.5
- S_c' = 650 psi (4,480 kPa)
- S_0 = 0.40
- C_d = 1.0
- k = 200 (assumes use of CSBC)

Thicknesses (and associated k value) assume firm and unyielding subgrade conditions.

Table 2.6. PCC Slab Thicknesses for Limited Contraction Joint Performance for New or Reconstructed Pavements (Non-Doweled Joints and ACB)

Design Period ESALs	Slab Thickness,[1] mm		
	Reliability 75%	Reliability 85%	Reliability 95%
<5,000,000	215	230	255
5,000,000-10,000,000	245	260	285
10,000,000-25,000,000	285	300	330

[1]Based on 1986 *AASHTO Guide for Design of Pavement Structures* for plain jointed pavement and the following inputs:

- J = 3.4
- E_c = 4,000,000 psi (27,600 MPa)
- ΔPSI = 1.5
- S_c' = 650 psi (4,480 kPa)
- S_0 = 0.40
- C_d = 1.0
- k = 400 pci (assumes use of ACB)

Thicknesses (and associated k value) assume firm and unyielding subgrade conditions.

Table 2.7. PCC Slab Thicknesses for Improved Contraction Joint Performance for New or Reconstructed Pavements (Doweled Joints and CSBC)

Design Period ESALs	Slab Thickness,[1] mm		
	Reliability 75%	Reliability 85%	Reliability 95%
<25,000,000	260	275	300
25,000,000-50,000,000	290	305	335
>50,000,000	310	325	355

[1]Based on 1986 *AASHTO Guide for Design of Pavement Structures* for doweled, plain jointed pavement and the following inputs:

- J = 2.7
- E_c = 4,000,000 psi (27,600 MPa)
- ΔPSI = 1.5
- S_c' = 650 psi (4, 480 kPa)
- S_0 = 0.40
- C_d = 1.0
- k = 200 pci (assumes use of CSBC)

Thicknesses (and associated k value) assume firm and unyielding subgrade conditions.

Table 2.8. PCC Slab Thicknesses for Improved Contraction Joint Performance for New or Reconstructed Pavements (Doweled Joints and ACB or ATPB)

Design Period ESALs	Slab Thickness,[1] mm		
	Reliability 75%	Reliability 85%	Reliability 95%
<25,000,000	230	240	265
25,000,000-50,000,000	255	270	295
>50,000,000	275	290	315

[1]Based on 1986 *AASHTO Guide for Design of Pavement Structures* for doweled, plain jointed pavement and the following inputs:

- J = 2.7
- E_c = 4,000,000 psi (27,600 MPa)
- ΔPSI = 1.5
- S_c' = 650 psi (4, 480 kPa)
- S_0 = 0.40
- C_d = 1.20
- k = 400 pci (assumes use of ACB or ATPB)

Thicknesses (and associated k value) assume firm and unyielding subgrade conditions.

considered a minimal (or limited) performance standard for PCCP contraction joints. A J factor of 2.7 represents improved or enhanced PCCP contraction joint performance.

To achieve a J factor of 3.4, undoweled PCC slabs are placed on an ACB with a free draining shoulder section. This section is shown in Figure 2.2(a).

To achieve improved contraction joint performance, dowel bars must be used at all contraction joints. For typical WSDOT PCC aggregates, a J factor of 2.7 was used to develop the slab thicknesses shown in Table 2.7, and 2.8. This assumes that the doweled PCCP is placed on a permeable base as shown in Figures 2.2(b) and 2.3. In addition, urban rigid pavement will have tied PCC shoulders as well, as shown in Figure 2.3.

PCC slab thicknesses other than those shown in Tables 2.5 through 2.8 can be used if justified by use of job specific input values in the *AASHTO Guide for Design of Pavement Structures*. Such input values must be approved by the WSDOT Materials Laboratory. For projects which are projected to have substantial numbers of transit vehicles (buses), doweled contraction joints should be considered.

The reliability levels to use in Tables 2.5 through 2.8 are the same as shown in subparagraph 3.3.2 of this SECTION for the National Highway System classifications.

The total depth of the pavement section must exceed one-half of the maximum expected depth of freezing when the subgrade is classified as a frost susceptible subgrade.

4.2.3 RAMPS AND FRONTAGE ROADS

The same requirements apply to rigid pavement ramps and frontage roads as for flexible pavements as noted in Paragraph 3.3.3 of this SECTION.

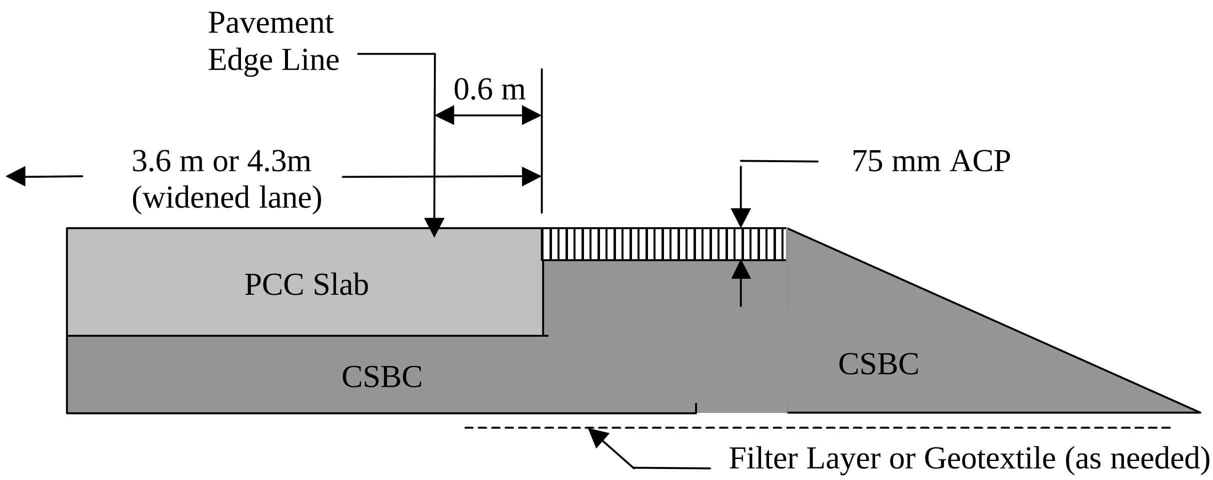
4.2.4 REST AREAS

The minimum rigid pavement requirements for rest area roadways and parking areas are:

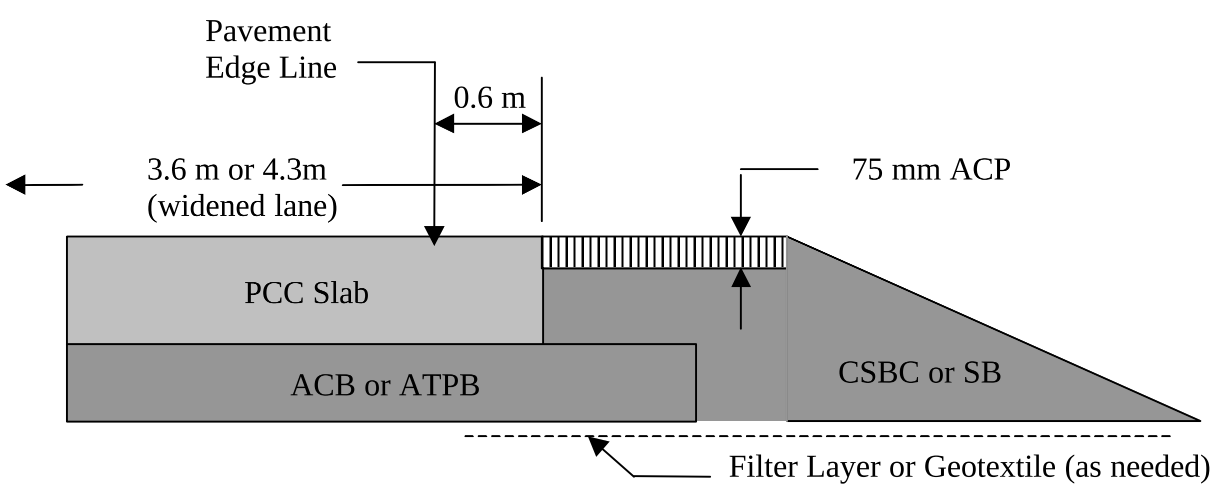
- Ramps, Access Roads, and Truck Parking — 230 mm PCCP
90 mm ACB
- Car Parking — 200 mm PCCP
90 mm ACB

Project specific traffic and subgrade soil conditions may require thicker pavement layers. Such designs should be done in accordance with the *AASHTO Guide for Design of Pavement Structures*.

The total depth of the pavement section must exceed one-half of the maximum expected depth of freeze when the subgrade is classified as a frost susceptible subgrade.



(a) Undoweled PCC Slabs on CSBC
(Crushed Surfacing Base Course)



(b) Doweled PCC Slabs on ACB or ATPB
(Asphalt Concrete Base or Asphalt Treated
Permeable Base)

Figure 2.2 Typical PCC Pavement Sections

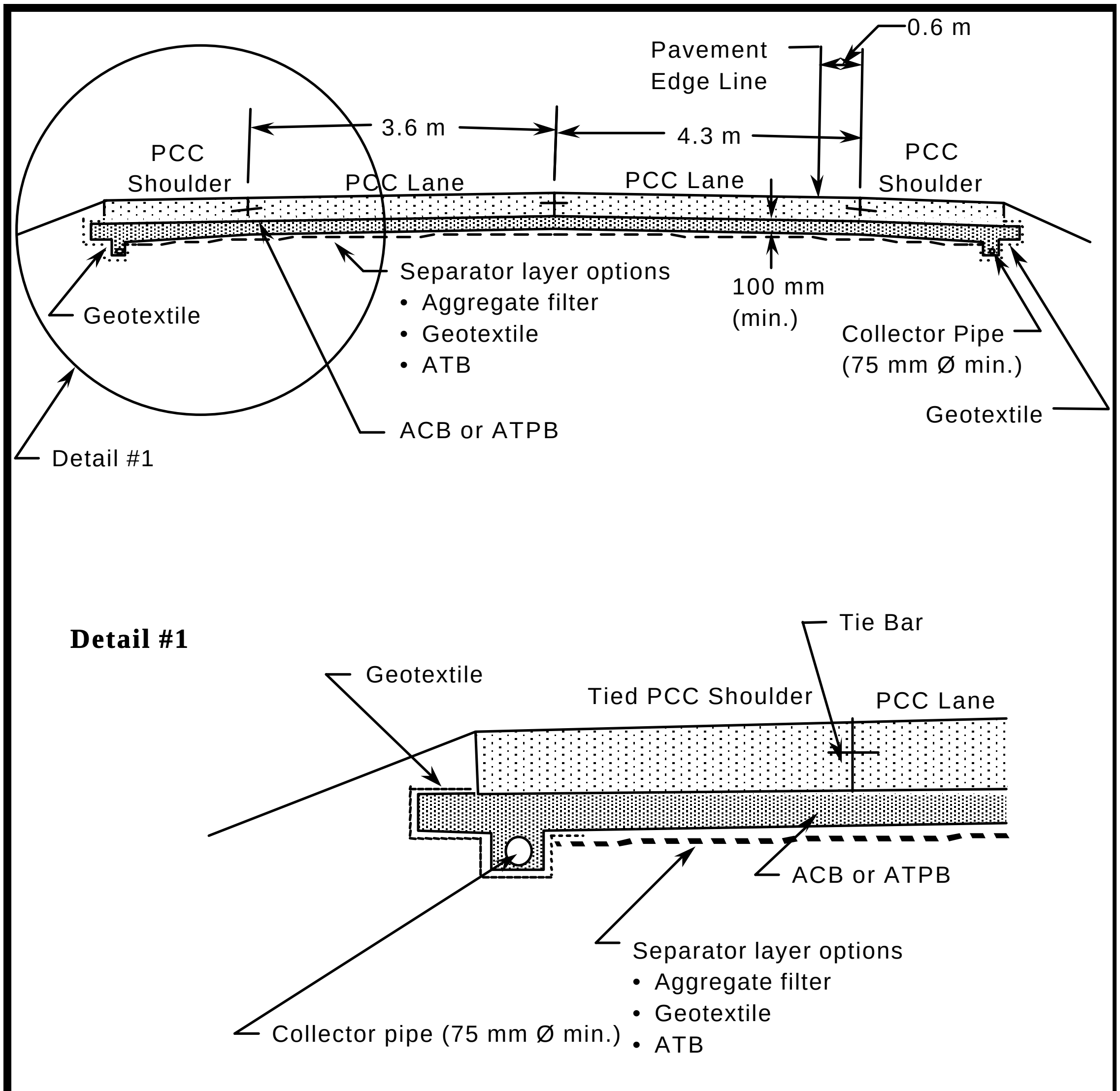


Figure 2.3. Urban PCC Pavement Section with Improved Contraction Joint Performance

4.2.5 SHOULDERS

When PCC shoulders are used they shall have the same PCC slab and base thicknesses as the mainline roadway PCCP (refer to Figure 2.3). Additionally, the shoulder and mainline roadway PCC shall be tied together with deformed steel bars.

5. PAVEMENT REHABILITATION INCLUDING OVERLAYS

5.1 REHABILITATION DESIGN PROCESS

5.1.1 BASIC ELEMENTS

A pavement rehabilitation survey is prepared by the Regional Materials Engineer for all resurfacing or rehabilitation projects.

A pavement rehabilitation project usually deals with existing pavements which show obvious signs of distress or failure. As a result, the amount of data acquired for each survey may vary in both quantity and detail, depending on the condition of the roadway and the amount of data on file, such as earlier soils reports. The survey data is incorporated into the soil report where the scope of the project warrants a soil survey (that is, significant widening, cuts or fills). The survey includes pavement deflection data, descriptions and photographs of typical pavement conditions, road life history, pavement cores, base course and subgrade samples, and a review of drainage features. The survey should be oriented toward analyzing the existing roadway conditions so that a reasonable definition of the special problems and structural needs of the roadway may be made.

5.1.2 DEFLECTION SURVEY

A pavement deflection survey is performed on selected projects by the headquarters Materials Branch. This survey should be conducted before the rehabilitation report to aid the Regional Materials Engineer in coring and sampling of each project. The deflection survey should be conducted, when possible, either in late fall or early spring. The Regional Materials Engineer should coordinate with the headquarters Materials Branch so that most of the deflection surveys are conducted during one time period each year. After conducting the deflection surveys, the headquarters Materials Branch will report the results of the survey to the Regional Materials Engineer along with recommended sampling areas and estimated pavement rehabilitation needs.

5.1.3 DESIGN PERIOD

The rehabilitation design period is the time from rehabilitation construction to a terminal condition. Rehabilitation designs will typically have a design period of 15 years. This design period can be changed, if needed, for project specific conditions.

5.1.4 TRAFFIC DATA

Traffic data from the TRIP's traffic file will be used on most projects, as contained in the Washington State Pavement Management System (WSPMS). Volume 2, SECTION 2.0, of this Guide provides insight into how such information (truck counts) is converted to ESALs. Where the headquarters Materials Branch or Regional Materials Engineer feel the data in the file is not adequate, a special traffic count on the project can be requested to verify the data. If the region does not have personnel to conduct the traffic counts, the Transportation Data Office of the Planning and Programming Service Center should be contacted for assistance.

5.1.5 PAVEMENT REHABILITATION REPORT

A pavement rehabilitation report is to be prepared for all ACP overlays and is recommended for BST overlays where structural problems are evident. The Regional Materials Engineer will prepare the report for review by the headquarters Materials Branch which will summarize the findings of the pavement rehabilitation survey, including discussion of special features or problems and recommendations concerning possible rehabilitative measures. The report is to be transmitted by letter from the Regional Administrator to the Materials Engineer. If the Regional Administrator or the Regional Administrator's staff is considering or would like to consider different designs or recommendations other than those contained in the report, this should be discussed in the transmittal letter.

The report should cover the following topics, insofar as they pertain to the project and include any other information pertinent to the analysis of the pavement rehabilitation needs:

5.1.5.1 General

Description of the project using vicinity maps and plan views, status and scope of project, climatic conditions, traffic conditions, and possible construction contingencies.

5.1.5.2 Geology and Physiography

Pertinent topographic features as they relate to subgrade soil changes and pavement performance.

5.1.5.3 Pavement Condition

Description and photographs of existing pavement conditions with reference to pavement distress, subgrade soils, geologic features, drainage, frost distress or traffic.

5.1.5.4 Drainage and Water Conditions

Description of pertinent drainage features such as ditches, subgrade drains, drainage blankets, etc., both functioning and nonfunctioning. Where wet subgrades are encountered, moisture contents should be determined.

5.1.5.5 Pavement Layer Profile

Profile showing layer depths (see Figure 2.4) and limits as they relate to past contracts, along with core and subgrade soil data. When deflection data is available, core sampling should be taken every 0.5 to 1.0 km of the project's length. Special areas of distress, particularly frost distress, should also be noted.

5.1.5.6 Materials

Source of materials to be used on the project along with special materials where warranted.

5.1.5.7 Construction Considerations

Items such as project timing, preleveling, digouts, subsealing, crack sealing, potential problems with materials sources, etc., should be covered.

5.1.5.8 Special Features

Review any unique features pertinent to the project not covered under other topics.

5.1.5.9 Recommendations

Specific recommendations as warranted concerning pavement rehabilitation design, correction of special problems, unique use of materials or procedures, drainage features, frost distress corrections, etc.

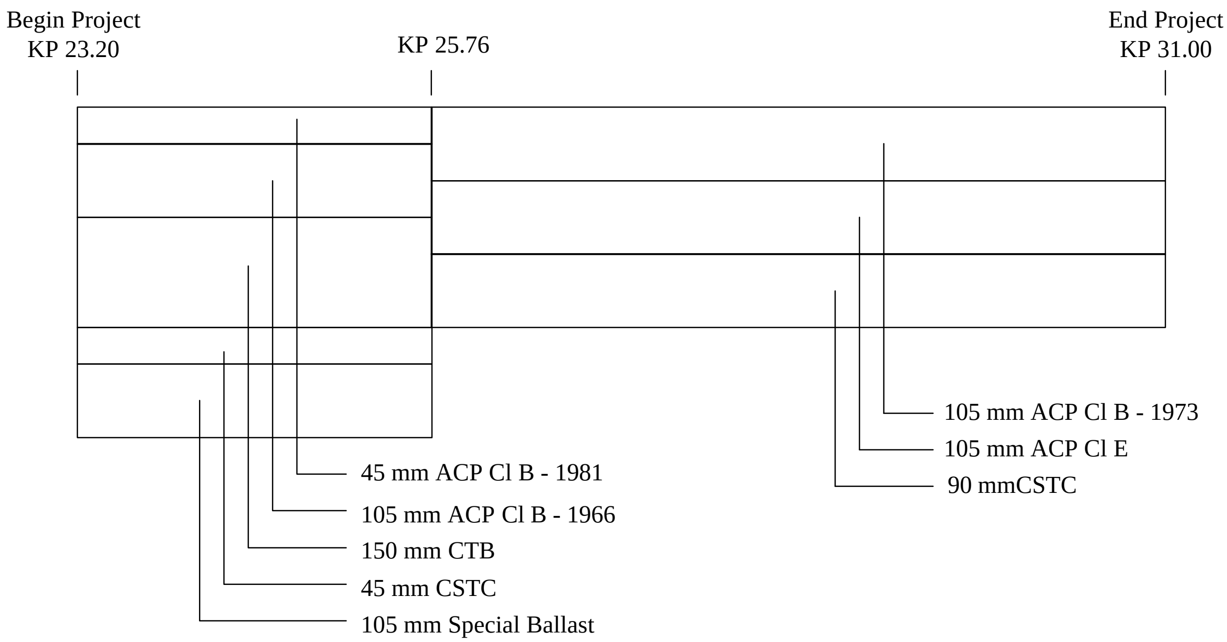


Figure 2.4. Illustration of Pavement Sections

5.1.6 MATERIAL ENGINEERS REPORT

After the headquarters Materials Branch has evaluated the pavement rehabilitation report, tested base course and subgrade samples (where applicable) and verified pavement rehabilitation recommendations, a report is prepared reviewing and commenting on the various features and rehabilitation needs of the project. This report is then sent to the Regional Administrator with a copy to the State Design Engineer.

5.2 DESIGN PROCEDURES

5.2.1 OVERLAY DESIGN

5.2.1.1 AC Overlays

AC overlay design can be accomplished either by use of the mechanistic-empirical based scheme used in the EVERPAVE computer program or the recently revised AASHTO procedure (*AASHTO Guide for Design of Pavement Structures*, Part III, Chapter 5). Both of these approaches are fully described in Volume 2 of this Guide. The EVERPAVE program is for use only for flexible pavements. The AASHTO procedure can be applied to either flexible or rigid pavement structures.

5.2.1.2 Granular Overlays (Cushion Courses)

The granular overlay system (often referred to as a "cushion course") is an alternative type of overlay for rehabilitating mostly low volume, rural roads (this does not necessarily imply a <u>low</u> number of ESALs). The overlay consists of a layer of densely compacted, crushed rock (generally WSDOT Crushed Surfacing Top Course or Base Course) overlain by a generally thin surface layer. A thickness design process is described in Volume 2, SECTION 7.0, of this Guide.

5.2.1.3 PCC Overlays

Generally, only <u>unbonded</u> PCC overlays will be used if a PCC surfacing is selected. Bonded PCC overlays are not considered as a structural solution and have a higher than acceptable risk of premature failure. Unbonded PCC overlays will be designed by use of the *AASHTO Guide for Design of Pavement Structures*.

5.3 DETERMINATION OF PAVEMENT LAYER THICKNESSES

5.3.1 OVERLAYS

5.3.1.1 AC Overlays — Structural

The minimum depth of AC overlay required for structural applications will be 40 mm. Depths less than 40 mm should be considered as a temporary pavement rehabilitation alternative.

5.3.1.2 AC Overlays — Nonstructural

A nonstructural overlay can be any depth which achieves adequate density during construction. For example, WSDOT Class G (100% passing 12.5 mm sieve) can be successfully placed at depths of less than 25 mm in the proper paving conditions (including weather).

5.3.1.3 Granular Overlay

The surfacing depth can vary depending on local conditions and requirements; however, the crushed stone depth should not exceed 150 mm in order to achieve the maximum structural benefit.

5.3.1.4 PCC Overlay

The minimum, unbonded PCC slab thickness should not be less than 200 mm unless a special analysis indicates otherwise. Normally, unbonded PCC overlay thicknesses will be about as thick as new PCC construction.

SECTION 2.0, APPENDIX 2.1

PAVEMENT TYPE
SELECTION COMMITTEE DIRECTIVE

Department of Transportation

DIRECTIVE

D 21-02

Effective Date

July 7, 1992

Deputy Secretary of Transportation

Pavement-Type Selection Committee

I. **Introduction, Purpose and Scope**

To establish a Pavement-Type Selection Committee to determine pavement for projects involving certain design classes and for Portland Cement Concrete Pavement (PCCP) rehabilitation projects.

II. **Rules**

A. For projects involving certain design classes designated in M 22-01, "Design Manual," and for PCCP rehabilitation projects, the Pavement-Type Selection Committee evaluates engineering considerations, economics, and current criteria before determining the type of pavement.

B. The Pavement-Type Selection Committee is composed of:

1. Assistant Secretary for Program Development (Chair)
2. Assistant Secretary for Operations
3. State Design Engineer
4. Program Management Engineer
5. Materials Engineer (data collector)
6. District Administrator of the district in which the project under consideration is located

C. The Assistant Secretary for Program Development (or designee) develops guidance concerning pavement-type selection and monitors compliance.

D. Each District Administrator uses the criteria stated in M 22-01, "Design Manual," to determine when consideration of type of pavement is referred to the Pavement-Type Selection Committee; in addition, all PCCP rehabilitation projects are referred. Exceptions from requirements of the Design Manual may be granted by the State Design Engineer; requests for exceptions are sent to the headquarters Materials Engineer.

INTRODUCTION, RULES

D 21-02

III. Procedures

A. Projects Going to the Pavement-Type Selection Committee (Committee)

Action By	Action
District Administrator	1a. If project is in design class which Design Manual requires be referred to the Committee, submits to the Materials Engineer: DOT Form 220-001, Pavement-Type Selection: Analysis of Individual and Economic Factors (see Appendix 2). DOT Form 220-002, Pavement-Type Selection: Roadway Section Data (see Appendix 3). or
District Administrator	1b. If project is a PCCP rehabilitation project: 1. Develops required data (see M 22-01, "Design Manual"). 2. Submits required data to headquarters Materials Engineer.
Headquarters Materials Engineer	2. Compiles data and information for the Committee.
Assistant Secretary for Program Development	3. Convenes the Committee.
Committee	4. Makes determination concerning type of pavement for the highway.
Assistant Secretary for Program Development	5. Notifies the District Administrator of the Committee's decision.

B. Requests for Exception

Action By	Action
District Administrator	1. Sends exception request (see M 22-01, "Design Manual") with statement of justification.
Headquarters Materials Engineer	2. Reviews request and prepares recommendation.
	3. Sends request and recommendation to State Design Engineer for approval/disapproval of the request.
State Design Engineer	4. Notifies the District Administrator of approval/disapproval.

Washington State Department of Transportation

Memorandum

Date: April 29, 1998

From: D. J. Jackson
Phone: (360) 709-5400

Subject: Pavement Type Selection Committee Requirements for Activating the Pavement Type Selection Committee Meetings

To: Don Nelson, Assistant Secretary, Environmental & Engineering Service Center

When the pavement type selection has been completed and forwarded to the FOSSC Materials Laboratory, the Pavement Division will formulate the Pavement Type Selection Committee (referred to as the Committee) Approval Letter and request that each member of the Committee sign and forward the letter on to the next member. The Committee is not required to convene if the life cycle cost analysis between the alternatives is greater than 15 percent and the recommendations are acceptable to both the Region and the FOSSC Materials Laboratory. The Approval Letter will provide the necessary documentation that supports the Committee's selection of the pavement type.

Projects to be reviewed will be distributed to the Committee members for approval (recommended Approval Letter attached). Based on this review and obtaining consensus from the Committee, the Pavement Division will either process the Approval Letter, take appropriate action to obtain consensus, or convene the Committee.

In order to expedite the required time and expended level of effort for the review of pavement type selection projects, I would like to recommend the following procedure for the Pavement Type Selection Committee:

1. The Committee should convene if the pavement type recommended by the Region is contrary to engineering recommendations. Engineering recommendations will be subject to the review of the Pavement Division or any member of the Committee. Under these circumstances it will be the responsibility of the Pavements Division or the Committee member to formulate, in writing, why the selected pavement type is not appropriate and distribute his/her rationale to all members. If all members agree with the recommendations, a meeting will not be necessary, otherwise the Committee should convene.

DOT 700-008X - E
Revised 6/92

Don Nelson
April 29, 1998
Page 2

2. The Committee should convene at the request of any member.

DJJ:lmp
Attachment

APPROVED: ______________________ DATE: 4/30/98
Don Nelson
Assistant Secretary
Environmental & Engineering Service Center

Washington State Department of Transportation
Sid Morrison
Secretary of Transportation

Field Operations Support Service Center
Materials Laboratory
P.O. Box 47365
Olympia, WA 98504-7365

360-709-5400
Fax 360-709-5588

PAVEMENT TYPE SELECTION

SR-5
Tacoma Vicinity HOV
MP 126.54 to MP 136.61

The Pavement Type Selection Committee has reviewed the Individual and Economic Factors submitted for the project "Tacoma Vicinity HOV" between mileposts 125.54 and MP 136.61.

The project consists of adding HOV lanes, reconstruct or modify ten interchanges, add auxiliary lanes, reconstruct the drainage system, and build, rebuild, or modify more than 60 bridges.

The analysis of the individual factors resulted in both pavement types (ACP and PCCP) being viable. In the analysis of the economic factors, one PCCP alternative was compared to one ACP alternative.

The Olympic Region has determined reconstructing the roadway with PCCP compares favorably with the ACP alternative. The economic analysis shows the PCCP alternative is two percent less than that of the ACP annualized cost. The use of PCCP will provide a pavement surface which will require minimal maintenance or rehabilitation treatments over a 40 year period. The need for periodic overlays as required with ACP would be eliminated which would be the greatest benefit through this urban area.

The Pavement Type Selection Committee

Don Nelson
Assistant Secretary
Environmental and Engineering

Brian Ziegler
State Design Engineer

John Conrad
Assistant Secretary
Field Operations

Randy Hain
Director of Program Management

Dennis Jackson
State Materials Engineer

Gary Demich
Olympic Region Administrator

Washington State
Department of Transportation
Duane Berentson
Secretary of Transportation

Transportation Building
P.O. Box 47300
Olympia, WA 98504-7300

PAVEMENT TYPE SELECTION

SR-270
Johnson Road to Idaho State Line
MP 3.95 to MP 9.89

The Pavement Type Selection Committee met on March 15, 1993 and completed its review of the Individual and Economic Factors submitted for the project "SR-270 Johnson Road to Idaho State Line" between MP 3.95 and MP 9.89.

The project consists of the construction two new separate lanes to carry westbound traffic on SR-270 from Johnson Road to the Idaho State Line.

The analysis of the individual factors resulted in both pavement types (ACP and PCCP) being viable. In the analysis of the economic factors, one PCCP alternative was compared to one ACP alternative. The PCCP and ACP alternatives were both based on the use of a 12-ft left lane and a 14 ft right lane. In the economic comparison of the alternatives, there is a cost advantage in the use of ACP over PCCP. With both the Individual and Economic Factors supporting the use of ACP, the Committee voted for the use of ACP on this project.

The Pavement Type Selection Committee

Skip Burch E. R. Burch
Assistant Secretary for Program Development

Jim Buss James Buss
Assistant Secretary for Operations

Rod Finkle
Materials Engineer

Dennis Jackson
State Design Engineer

Randy Hain R. A. Hain
Program Management Engineer

Jerry Lenzi J. C. Lenzi
District 6 Administrator